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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application Of: )  
)  
Michael Chad HOLLIS, *et al.* ) GROUP ART UNIT: 3724  
)  
APPLICATION NUMBER: 10/717,536 ) EXAMINER: Stephen CHOI  
)  
FILED: November 21, 2003 ) CONFIRMATION NO.: 7980  
  
FOR: BEVEL ANGLE LOCKING ACTUATOR AND BEVEL ANGLE LOCKING SYSTEM  
FOR A SAW

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION OF PRIOR INVENTION UNDER 37 C.F.R § 1.131**

Dear Sir:

WE, Michael Chad Hollis and Craig Allen Carroll, the applicants and co-inventors of the above-identified patent application declare as follows:

1. THAT we are co-inventors of the subject matter of all the pending claims (i.e., claims 1-5, 29-31, and 52-54) of the above-identified U.S. Patent Application. We have assigned all rights, title and interest in the above-identified invention to Delta International Machinery Corp. This declaration is submitted in furtherance of prosecution of the above-identified patent application.
2. THAT we filed a provisional application (the "provisional application") on November 26, 2002 describing the invention. The provisional application was assigned serial number 60/428,931. The above-identified application was then filed on November 21, 2003, claiming the benefit of the provisional application.
3. THAT prior to November 8, 2002 we had conceived and diligently worked to reduce to practice the invention described in the provisional application, as defined by claims 1-5, 29-31, and 52-54, and as evidenced by the attached solid model renderings (Exhibit A) annotated figures. The attached email dated October 30, 2002, the attached fax dated November 25, 2002, and the attached email dated November 26, 2002 (Exhibits B-D respectively) are further evidence that we were diligent prior to November 8, 2002 up to the point of constructive reduction to practice of the above-identified invention. The October 30 email (Exhibit B) shows that a draft of the provisional application was ready for our review on October 30, 2002. The November 25 fax (Exhibit C) is evidence of our corrections to that provisional application on that date, and the November 26 email (Exhibit D) is

further evidence of our diligence to file the provisional application in a timely manner.

4. THAT the conception and reduction to practice was performed entirely within the United States.
5. THAT all statements made herein of our knowledge are true, that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine, or imprisonment, or both under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

\_\_\_\_\_  
Michael Chad Hollis

Date: \_\_\_\_\_

*Craig A. Carroll*  
Craig Allen Carroll

Date: 3/29/06



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Michael Chad Hollis

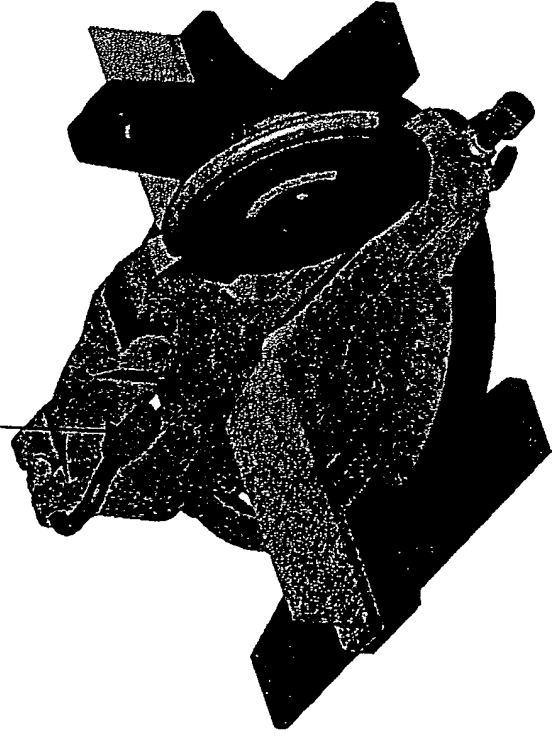
Date: 3-30-06

\_\_\_\_\_  
Craig Allen Carroll

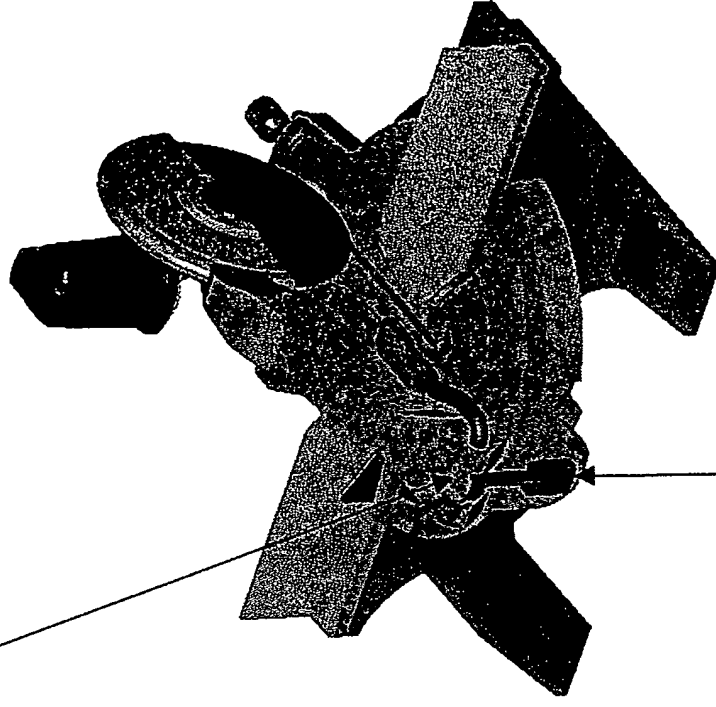
Date: \_\_\_\_\_

## Overview of Bevel Locking Mechanism

Bevel lock lever

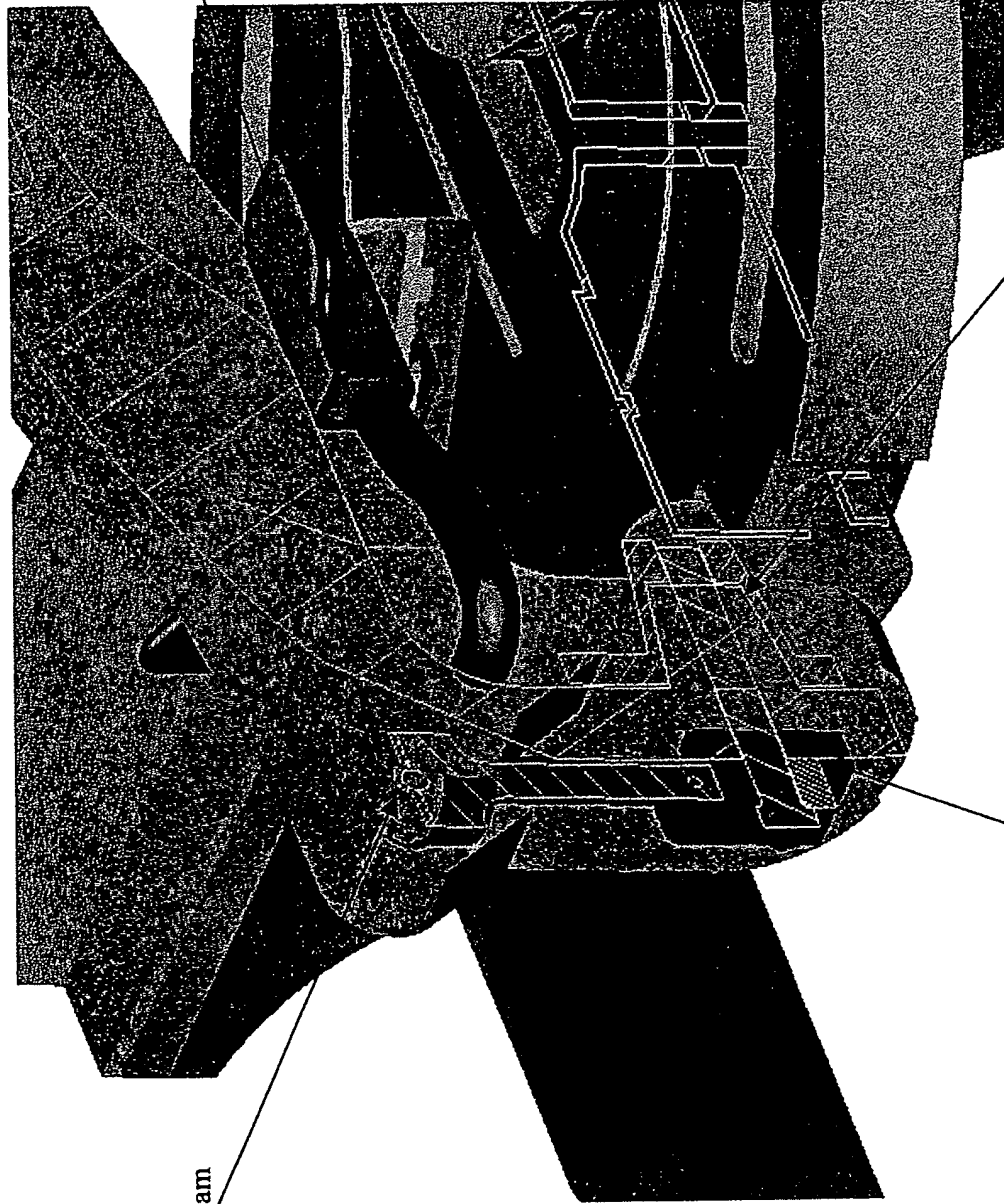


Cam-action on lever



Wedging block

## Cross-section of Bevel Locking Mechanism



As lever is moved downward, eccentric cam forces linkage upward.

As linkage moves upward, male taper is forced into female taper.

Eccentric cam

Casting is tapered parallel to taper on wedging block.

## Exhibit B

Ririe, Andrew

---

**From:** Ririe, Andrew  
**Sent:** Wednesday, October 30, 2002 11:16 AM  
**To:** Chad Hollis (E-mail)  
**Cc:** Campbell, Chris  
**Subject:** draft of provisional pat. app. for lever bevel lock

Chad,

I am attaching a working draft of the bevel lever lock provisional patent app. I welcome all comments from you. In one or two places I specifically ask for your comments and additional information about the design. Please note that I still have a few notes to myself in this draft regarding sections of the application that need further work.

I look forward to hearing back from you. As soon as we get this filed (hopefully in less than a week), I plan to start working with you on the provisional patent application for the sliding fence and clamp on the 3809.

Best regards,

--Andrew Ririe

11/25/2002

## Exhibit C

Thanks,  
Chad





HUNTON &  
WILLIAMS



IN THE  
UNITED STATES  
PATENT AND  
TRADEMARK  
OFFICE

PATENT APPLICATION

Title of Application: Bevel Locking Mechanism on a Miter Saw

Type of Application: Provisional

Inventors: ~~Chad Michael Hollis~~ *Michael / Chad Hollis*  
*Craig Allen Carroll*

Attorney Contacts: Chris Campbell (703) 714-7553,  
Andrew Ririe (202) 955-1672 *Craig Allen Carroll*

H&W Matter No: 56709.000013

App. Serial No: *Not yet assigned*

Filing Date: *Not yet assigned*

Last Edit Date: September 26, 2002

Instructions: Please review this draft of the provisional patent application to be sure all of the relevant details of the inventive concepts have been fully stated and adequately explained.

PROPRIETARY AND CONFIDENTIAL, ATTORNEY-CLIENT PRIVILEGED  
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## Bevel Locking Mechanism on a Miter Saw

### Background

Compound miter saws typically comprise a base assembly having a turntable rotatably mounted on a base to turn about a vertical axis, and a saw support assembly pivotally mounted to the turntable to turn about a horizontal axis coplanar with the top of the base assembly and normal to the axis of the turntable. Miter saws also typically comprise a saw unit pivotally mounted to the saw support assembly to plunge a saw blade into a work piece lying on the base. The base assembly also typically has a fence attached to the base for aligning a workpiece on the base assembly and holding it in position during a cut. The miter angle is the angle of cut adjusted by rotating the turntable and the saw blade about the vertical axis. The bevel angle is the angle of cut adjusted by rotating the saw support assembly and the saw blade about the horizontal axis. In a compound miter saw, the miter angle and the bevel angle can be adjusted independently of one another, or they can be adjusted simultaneously to make a compound angle cut with a miter angle component and a bevel angle component.

Other types of saws may also have the ability to adjust the bevel angle of cut. For example, a dry metal cutting saw such as [look for one off of the list] *what list?* may include a saw support assembly mounted to a base (without a turntable), *1410?*

where the saw support assembly pivots about a horizontal axis coplanar with the top of the base to adjust the bevel angle of cut.

This invention relates generally to saws where the bevel angle of cut can be adjusted.

5        In order to set-up for a cut including a bevel angle component, the bevel angle is first adjusted to the desired angle by rotating the saw support assembly and the saw unit about the horizontal axis. The saw support assembly must then be locked to hold to the desired bevel angle while the cut is being made. Prior art bevel angle locking mechanisms clamp together opposing surfaces of the saw support assembly and the base assembly to hold the bevel angle with friction. 10        The bevel angle locking mechanism described in U.S. Patent No. 5,235,889 ("the '889 patent") is illustrative. Typically these bevel angle locking mechanisms have comprised a shaft or pin projecting from the base assembly out through the saw support assembly, such as shaft 81 in FIG. 7 of the '889 patent. A handle is 15        threaded onto the end of the post or pin projecting from the saw support assembly, such handle 78 in combination with stop 81 in FIG. 7 of the '889 patent. When the nut is tightened, the saw support assembly is pushed against the base

assembly and friction prevents the saw support assembly from rotating relative to the base assembly.

The above-described type of bevel angle locking mechanism suffers from the drawback that it is sometimes awkward to reach around to the back of the saw to loosen and tighten the nut for locking the bevel angle.

Brief Description of the Drawing Figures

FIG. 1 is an isometric view of an exemplary miter saw incorporating an exemplary embodiment of the bevel locking system of the present invention.

FIG. 2 is an isometric view of the bevel locking system of FIG. 1 in an unlocked position.

FIG. 3 is a detail, plan view of the bevel locking system in the same position as in FIG. 2.

FIG. 4 is an isometric view of the bevel locking system of FIG. 1 in a locked position.

FIG. 5 is a detail, plan view of the bevel locking system in the same position as in FIG. 4.

FIG. 6 is an exploded view of some of the components of the exemplary bevel locking system of the present invention.

#### Detailed Description of the Invention

An exemplary miter saw is shown in FIGS. 1-6. The inventions described  
5 herein can be used with any type of miter saw, it is not limited to use in the particular type of miter saw depicted in the figures. In addition, the inventions described herein may be useful for other types of saws which are capable of making bevel angle cuts, such as the dry metal saw already referred to above. The description herein of the invention as it can be used with a miter saw should  
10 be sufficient to show how the invention could also be applied to other types of saws.

An exemplary embodiment of the inventions is incorporated into the miter saw shown in FIGS. 1-6. It should be likewise understood that the inventions are capable of being practiced in other embodiments dissimilar in  
15 certain respects to the particular embodiment depicted in the figures. The scope of the invention is not intended to be limited by the depiction of the particular embodiment in the figures, nor the written description of that embodiment which follows.

An exemplary miter saw is shown in FIG. 1 comprising a base assembly 100 which can include a base 110 and a turntable 120. The turntable 120 is rotatably supported by the base 110 to turn about a vertical axis. A handle 121 can be grasped by the user to rotate the turntable 120 on the base 110 about a vertical axis to adjust the saw's miter angle. A miter lock is provided to lock the turntable 120 at a desired miter angle. The miter lock can be provided, as is known in the art, integral with the handle 121. By turning the handle 121, the turntable 120 can be clamped to the base 110 using screw threads formed on the handle. A detent system may also be provided, as is known in the art, for assisting the user in adjusting the turntable 120 to commonly used miter angles. The detent system may have an override actuator 122, commonly a lever, mounted in close proximity to the handle 121.

*also using  
cam/linkage  
system.*

The base assembly 100 may also include a fence assembly 130. The fence assembly 130 may be mounted to the base 110 and overlap a portion of the turntable 120, as shown in FIG. 1. A top surface 101 of the base assembly 100 and the front surface of the fence assembly 130 together support a workpiece during cutting.

A saw support assembly 200 is rotationally mounted to the turntable 120 to rotate about a horizontal axis. The saw support assembly 200 is rotationally

In this embodiment, the rotational connection of the saw support

6

A saw assembly 300 is pivotally mounted to the saw support assembly 200. In the illustrated embodiment, the saw assembly 300 may include an upper arm 310. The saw support assembly 200 may include a lower arm 210. The upper arm 310 and the lower arm 210 are pivotally connected with a pin 311. The saw assembly 300 mounts a saw unit 320 which has a motor driving a saw blade 321. The saw support assembly 200 pivots the saw assembly 300 about pin 311 to plunge the saw blade 321 into a workpiece lying on the top surface 101 of the base assembly 100. A handle 330 is connected to the saw assembly 300 and is graspable by the user to control the plunging of the saw blade 321 into the workpiece. The handle 330 includes a power switch 331 for actuating the motor of the saw unit 320.

The base assembly 100, or the saw support assembly 200, may also include a slide mechanism which permits the saw unit 320 to translate horizontally along an axis parallel with the top surface 101. In the illustrated embodiment, the slide mechanism 150 is part of the base assembly 100. The slide mechanism comprises two slide rods 151, 152. The slide rods 151, 152 are supported by and slide out from the turntable 120. The knuckle 140 is mounted to the slide rods 151, 152. A



slide mechanism may instead be part of a saw support assembly. In that case, a knuckle can be directly mounted to a turntable, or can be integrally formed with a turntable.

In the illustrated embodiment, the male conical surface 221 of the saw support assembly 200 is formed on a trunnion insert 220. The trunnion insert 220 is attached to the lower arm 210 during assembly of the miter saw with threaded fasteners (not shown). The trunnion insert 220 includes a cylindrical portion 222 on the end of which is formed the male conical surface 221. The cylindrical portion 222 engages a bore 211 formed through the lower arm 210 in such a manner that the male conical surface 221 extends out from the lower arm 210 towards the knuckle 140. One advantage of forming the male conical surface 221 on the trunnion insert 220 is simplified machining. The male conical surface 221 can be more easily machined on the relatively small trunnion insert 220 than on the lower arm 210. [Chad, I am guessing this is the case, is this true?

Comments?] Another advantage is that the trunnion insert 220 can be formed from a different metal than the rest of the lower arm 210. For example, the lower arm 210 could be formed from cast aluminum, while the trunnion insert 220 can be formed from cast iron. Aluminum on aluminum wear surfaces can be problematic. If the knuckle 140 (including the female conical surface 141) is

Reasons for making male trunnion on separate piece:  
taper

- 1.) Easier to machine
- 2.) Material needs to be dissimilar to Aluminum (steel is cast & this can due to galling effect - high friction coefficient.
- 3.) Tooling more expensive to add male taper to 210

In another embodiment (not shown), the bevel locking linkage could be wedged around a second shaft, parallel to the shaft 250 but spaced laterally therefrom. U.S. Patent No. 5,425,294 shows a miter saw design with two shafts, a

first shaft 4 and a second shaft connected to handle 5. In the '294 patent, handle 5 is rotated to push the saw support assembly against the base assembly. Instead, a bevel locking linkage could be associated with the second shaft so that when the linkage slides and is wedged, the second shaft will be tensioned and the bevel angle will be locked. [Note: need to clean this up]

The bevel locking linkage 230 is caused to slide by a camming mechanism comprising a bevel lever 260 and a cam shaft 270. Cam shaft 270 is rotationally supported by the saw support assembly 200 and includes an eccentric shaft portion 271. The eccentric shaft portion 271 is linked to the bevel locking linkage 230. The bevel locking linkage 230 has a curved portion 231 on the end thereof which creates a pocket into which the eccentric shaft portion 271 fits. The eccentric shaft portion 271 is retained in the pocket by a block 232 which is attached to the bevel locking linkage 230 with a fastener (not shown).

NOTE: THIS IS MORE LIKE A CRANK SHAFT (MAYBE WORD IT SO EITHER CAN BE USED)

One end of cam shaft 270 is fixed to the bevel locking lever 260. As the user moves the bevel locking lever 260, the cam shaft 270 rotates and the bevel locking linkage 230 is caused to slide up and down. FIG. 2 shows the bevel locking lever 260 in the unlocked or up position where the bevel locking linkage is pushed downward and the bevel angle is unlocked. FIG. 3 is a detail view

Does this need to be shown?

[Chad, what does the spring do that is between the trunnion insert and the locking flange.]

*The spring provides a small amount of force to the male taper so that when unlocked the cutter head will not disengage too far and cause the head to sag excessively.*

FIG. 4 shows the bevel locking lever 260 in the locked or down position

where the bevel locking linkage is pulled upward and the bevel angle is locked.

- 5 FIG. 5 is a detail view of the bevel locking lever 260 in the down position. In the down position, the bevel locking lever can conform to the profile of the lower arm 210 or other part of the saw support assembly 200 to be as unobtrusive as possible. The bevel locking lever can be inexpensively produced as a stamped metal part, with a handle injection molded on the end thereof.

- 10 This bevel locking system has several advantages over the prior art. First, the user no longer needs to reach around to the back of the miter saw to turn a bevel locking nut. The user has easy access to the bevel locking lever 260 which is mounted much closer to the front of the saw. Second, the bevel locking lever 260 provides a convenient signal to the user when the bevel angle is not locked.

- 15 Third, [Chad, can you comment on the advantages of the locking lever?]

*Actuating a long lever arm is ergonomically more user friendly than rotating a knob to achieve locking force.*

We Claim:

A1. A compound miter saw comprising:

a base assembly;

5 a saw unit having a saw blade turning about a first rotational axis to cut a  
workpiece;

a saw support assembly rotatably mounted to the base assembly, the saw  
support assembly rotating relative to the base assembly about a second  
rotational axis to adjust the bevel angle of the saw blade, and the saw  
support assembly supporting the saw unit and pivoting the saw unit to  
10 plunge the saw blade into a workpiece laying on the base assembly;

a bevel locking lever pivotally mounted to the saw support assembly, the  
bevel locking lever pivoting relative to the saw support assembly  
about a second rotational axis to actuate a bevel angle locking  
mechanism.

15 [B claims: Method of locking the bevel angle involving rotating a lever about  
an axis that is not the beveling axis. Deps include that the axis is orthogonal

and offset from the bevel axis, that in the locked position the lever is next to the saw support assembly's arm]

[C claims: Miter saw with bevel locking cam which translates in a direction orthogonal to the beveling axis to lock the beveling angle.]

- 5 C1. A miter saw comprising:
- a base assembly;
- a saw unit having a saw blade;
- a saw support assembly rotatably mounted to the base assembly, the saw support assembly supporting the saw unit and pivoting the saw unit to
- 10 plunge the saw blade into a workpiece lying on the base assembly, the saw support assembly rotating relative to the base assembly about a first rotational axis to adjust the bevel angle of the saw blade;
- a bevel locking linkage which translates in a direction normal to the first rotational axis, the translation of the bevel locking linkage causing the
- 15 saw support assembly to be pushed against the base assembly creating friction which prevents relative rotation.

something where there is a nut which is threaded to the post, but the part that moves to create the compressive pressure is not connected to the nut, or doesn't turn with the nut.

5 [D claims: Method claim like C claims]

*- more detail?*

[E claims: Miter saw with a separate, detachable trunnion piece that mounts to the saw support assembly, where the trunnion piece and the saw support assembly are made of different materials]

E1. A miter saw comprising:

10 a base assembly;

a saw unit having a saw blade turning to cut a workpiece;

a saw support assembly rotatably mounted to the base assembly, the saw support assembly rotating relative to the base assembly about a

horizontal axis to adjust the bevel angle of the saw blade, and the saw

15 support assembly supporting the saw unit and pivoting the saw unit to plunge the saw blade into a workpiece lying on the base assembly;

wherein the saw support assembly comprises a lower arm and a trunnion insert attached to the lower arm, the trunnion insert being made of a different metal than the lower arm.

- Milwaukee may have prior art  
in respect to claim E.



### Bevel Locking Mechanism on a Miter Saw

#### Abstract

A miter saw has a bevel locking lever for locking the bevel angle of the miter saw which is easier for the user to reach than prior art bevel angle locking mechanisms that are located at the rear of the miter saw. Also, a male conical surface for forming a trunnion for rotationally supporting the saw support assembly is formed on a trunnion insert which is mounted to the lower arm.

5

## Exhibit D

Ririe, Andrew

---

From: Ririe, Andrew

Sent: Tuesday, November 26, 2002 2:24 PM

To: Chad Hollis (E-mail); Craig Carroll (E-mail)

Subject: Provisional patent app. for the bevel locking lever on the 3809

Chad and Craig,

Thank you for reviewing the draft of the provisional patent application for the bevel locking lever on the 3809 miter saw. Your corrections and comments were very helpful. I incorporated each of your corrections into the copy of the application that is attached.

I am going to file the provisional application today. The provisional does not need to be in perfect form. The provisional must disclose the invention in enough detail so that another person of skill in this art would understand how to make and use the invention. I think we have achieved that. Please let me know if you see any other corrections that should be made, or any further details that should be included, before I file the provisional tonight.

Once the provisional is filed, it is my understanding that Delta will revisit the application in a few months and decide whether a regular application which can mature into a patent is merited.

Best regards,

--Andrew

11/26/2002

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